American Automobile Manufacturers Association

Chrysler Corporation Ford General Motors

RECEIVED

JUN 26 1996

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

June 26, 1996

DOCKET FILE COPY ORIGINAL

Mr. William F. Caton, Acting Secretary
Federal Communications Commission
1919 M Street N.W., Room 222
Washington, DC 20554

Dear Mr. Caton:

RE: Reply Comments to Federal Communications Commission, Docket 94-124; RM-8308; FCC 95-499 - Operation Above 40 GHz -Second Notice of Proposed Rule Making (NPRM)

The American Automobile Manufacturers Association (AAMA) submits the following reply comments for Federal Communications Commission (FCC) review and consideration. AAMA would like to emphasize that we continue to strongly support international harmonization of frequency bands for vehicular radar as the public would benefit from a uniform frequency assignment.

The AAMA reply comments are divided into three sections. The first section relates to issues addressed as potential concerns by the Radio Astronomy community. The second section of our comments provides US Department of Transportation data for the number of accidents which could be reduced when vehicles are equipped with collision avoidance devices. The third section responds to a request to change the peak-to-average ratio and sets forth concerns related to mandated design specifications rather than performance specifications.

No. of Copies rec'd 0+13
List ABCDE OET

HEADQUARTERS
1401 H Street, N.W. Suite 900, Washington, D.C. 20005
202•326•5500 FAX 202•326•5567

DETROIT OFFICE
7430 Second Avenue, Suite 300, Detroit, MI 48202
313•872•4311 FAX 313•872•5400

AAMA submits that vehicular radar is an emerging technology and commercial test equipment is not presently available to measure the power levels proposed by the Radio Astronomy community. Technology will develop over the next few years for both system and instrumentation development. In the interim, AAMA urges the FCC not adopt any rule more stringent than the proposed level of 1000 pW/cm^2 above 200 GHz.

Please contact me at the Association (313) 871-6334 if you require additional information concerning any aspect of our comments.

Sincerely,

Vann H. Wilber, Director
Safety and International Department
Engineering Affairs Division

1. Reply to Comments Submitted by Radio Astronomy Community

Comments were filed by the National Academy of Sciences' Committee on Radio Frequencies (CORF) in behalf of the Radio Astronomy community AAMA recognizes the importance of the work being done by Radio Astronomers and does not wish to impede their work. However, AAMA does not agree with CORF's recommended limit for the following technical and public policy reasons.

The manner in which the Radio Astronomers calculated the approach distance and subsequent effect of the radar system is overly pessimistic. Based on the limits of automotive radiated emissions in the standards of the Special International Committee on Radio Interference (CISPR 12) and the Society of Automotive Engineers Standard (SAE) J551-2, at 250 meters the vehicle engine radio frequency noise would exceed the International Telecommunications Union (ITU) interference limit by 15 to 20 dB (based on a vehicle just meeting the emissions limit at 100 MHz and extrapolating by sin(x)/x to 230 GHz). In addition, the first draft of the IEEE Vehicular Radar and Radio Astronomy Document[1] AAMA received through the Institute of Electrical and Electronic Engineers (IEEE), VRS-96-6 used a distance of one kilometer as typical of a control zone around a site. This extension of distance would result in the vehicle emissions being below the recommended ITU limits. The net results would change the calculated interference signal

[1] Vehicular Radar and Radio Astronomy, IEEE VRS-96-6; IEEE Vehicular Radar Standards Subcommittee, February 28, 1996, Boulder, CO; INTERNET Address for the Paper: http//www.its.bldrdoc.gov/~allen/IEEE_VRS/VRS_home.html

level to 55 pW/cm^2 for the broadband case and 74 pW/cm^2 for the narrowband case, as a potential minimum level for noninterference from vehicular radars.

In their calculations the Radio Astronomers also assumed that the transmitter power of the vehicle radar is spread over 300 MHz (three times the 100 MHz sweep they assumed). If a Fourier transform is done on this wave form, it can be shown that only half the energy is in that 300 MHz band. The remainder is spread over an additional 600 MHz divided evenly about the first 300 MHz. Using the Radio Astronomers calculations, the 74 pW/cm^2 lower level now becomes 148 pW/cm^2 as a background level required to prevent interference.

As AAMA pointed out in our comments to Docket 94-124, FCC 95-499, only moving vehicles should be included in this type of calculation since the radar must reduce its output level by 25 dB when the vehicle is stationary. As such, assuming the maximum energy of the third harmonic is radiated in the same direction as the fundamental frequency, the time of illumination of the radio astronomy antenna by the vehicle radar would be in seconds compared to the thousands of seconds used by the radio astronomy community for an observation.

Additionally, AAMA questions how many sensitive measurements can be made while the sun is visible in the sky since it is a very powerful radio noise source. If measurements cannot typically be made during daylight hours, the argument of high vehicle traffic density is questionable especially at radio astronomy sites, such as Kitt peak, considering that locations of measurement facilities and access roads which are controlled by the radio astronomy community.

The issue of vehicle radar maintenance was raised in the CORF comments. AAMA would like to put this concern to rest. A system as complex as the vehicle radar will not be designed to require maintenance during its lifetime. The automotive repair infrastructure does not have, nor is every likely to have, the expertise to service this type of system. Any defective unit will simply be replaced. Systems that are damaged or otherwise misaligned by an accident (which such radar system are intended to reduce) will result in an inoperative system, which its diagnostics should detect and warn the driver. This is the current strategy used by motor vehicle manufacturers for the air bag systems now in use and this system is working very effectively. Vehicle operators are given notice of a defect/failure via the instrument cluster and the vehicle is taken to the dealer and the unit replaced.

The issue of proliferation was raised implying a parallel to the problem of optical observatories being blinded by large city night lightning. AAMA considers this to be a false parallel. If, as the radar astronomy community suggests, the whole US vehicle population was equipped with a radar system, the total power being delivered to the antennas would be 2000 kW or 2.1×10^{-4} pW/cm^2 averaged over the US in the subject band (FCC rules effectively limit the input power to 10 mW). This is less power than one medium size city would consume for lighting.

The CORF comments also state that equipment for measuring the emissions in the 230 GHz band exist commercially and that their suggested 2 pW/cm^2 limit can be objectively and repeatibily measured. As noted by both AAMA and GM/Hughes, attempts to locate the referenced commercial measurement equipment have been futile to date. An attempt to make measurements at Kitt Peak using radio astronomer instrumentation was less than successful.

CORF implied that unless very strict limits are applied, the effectiveness of the Millimeter Wave Array could be compromised. One advantage of an array is the ability to use correlators (which have been used in radio astronomy for more than 30 years) which substantially reduces the effects of interference[2].

It has not been shown that the 2 pW/cm^2 limit can be met at a cost that will be economically viable by the motoring public. Moreover, the absence of adequate measuring equipment and test procedures for measuring 2 pW/cm^2 at 231 GHz precludes design verification. A 2 pW/cm^2 limit would thus deny the public the safety and other benefits of vehicle radar systems as detailed in the comments that follow.

[2] An Automatic Radio Interference Monitor for the National Radio Astronomy Observatory Very Large Array, C.C. Janes et. al., 1995 IEEE International Symposium on Electromagnetic Compatibility, page 411.

2. Potential Safety and Other Benefits of Collision Avoidance Devices

Sophisticated vehicle collision avoidance devices on motor vehicles have the potential to reduce highway traffic deaths, injuries, and associated costs to society. This section, using United States Department of Transportation generated data, reviews and highlights potential public benefits of vehicular radar systems.

Since 1991 the National Highway Traffic Safety Administration[3] (NHTSA) has had a concentrated program to facilitate the development and deployment of effective safety-related systems as part of the Department of Transportation Intelligent Vehicle Highway Systems (IVHS), recently renamed the Intelligent Transportation Systems, or ITS program. A key responsibility of NHTSA is to demonstrate that advanced technology can practicably enhance the collision avoidance performance of motor vehicles.

These advanced safety related systems include, but are not limited to: 1) Intelligent Cruise Control, 2) Forward Crash Avoidance Systems, 3) Forward Looking Automotive Radar Sensors, 4) Vehicle Lateral Position Data Collection and Analysis, 5) Automatic Braking for Heavy Vehicles.

[3] Department of Transportation, National Highway Traffic Safety Administration (NHTSA) Paper 96-S2-O-09 ; Experimental Safety Vehicle Conference, May 14, 1996. August Burgette, Office of Crash Avoidance

Collision avoidance technology applied to motor vehicles will significantly reduce crashes and subsequent fatalities and injuries according to the NHTSA paper.

According to the NHTSA calculations presented in their paper "Status Update of NHTSA's ITS Collision Avoidance Research Program, (Paper 96-S2-O-09)" implementation of collision avoidance systems will result in the following public benefits:

- roadway departure crashes will be reduced by 296,000 per year
- lane change/merge crashes will be reduced by 38,000 per year
- rear-end crashes will be reduced by 759,000 per year

if collision avoidance techniques were applied to motor vehicles on a 100% basis.

The National Safety Council[4] estimates a total cost of $176.5 billion dollars resulting from motor vehicle accidents for calendar year 1994. The total number of motor vehicle accidents in 1994 was 6,492,000 according to the US Department of Transportation[5].

The sum of relevant crashes (e.g. those that crash avoidance systems would benefit) shown in NHTSA paper 96-S2-O-09 . Table 5 is:

[4] National Safety Council, Accident Facts, 1995 Edition
[5] Traffic Safety Facts 1994: A compilation of Motor Vehicle Crash Data from the Fatal Accident Reporting System and the General Estimates System; National Highway Traffic Safety Administration; National Center for Statistics and Analysis; U.S. Department of Transportation, Washington, D.C 20590, August 1995

Roadway Departure	1,200,000
Lane Change/Merge	200,000
Rear End Crashes	1,700,000
TOTAL	3,100.000

According to NHTSA paper 96-S2-O-09, Table 5, the number of crashes reduced as a result of intelligent highway devices, (e.g. vehicle radar), is:

Roadway Departure	296,000
Lane Change/Merge	39,000
Rear End Crashes	759,000
TOTAL	1,067,000

Assuming a ratio between total accidents as given by the US Department of Transportation, relevant accidents benefiting from crash avoidance technology, and the cost to the public for motor vehicle accidents, an estimate of benefit, using these publicly available data, can be calculated.

$$\text{Effectiveness of Crash Avoidance Devices} = \frac{\text{Number of Reduced Crashes}}{\text{Total Number of Relevant Crashes}} = \frac{1{,}067{,}000}{3{,}100{,}000} = 0.34$$

According to NHTSA 39% of towed vehicle accidents are frontal impacts[6] and assuming that the majority of costs associated with vehicle accidents are from frontal crashes we estimate that the major benefit of crash avoidance devices would be for frontal crashes.

Assuming that the total effectiveness for vehicle crash avoidance devices has a direct relationship to reducing the cost of accidents, it can be shown that the National Safety Council motor vehicle accident cost data of $176.5 billion could be reduced by

Reduction in Cost /Year to Society by Equipping Vehicles with Collision Avoidance Equipment = Total Cost of Accidents * Effectiveness * Frontal Crash % NHTSA * $\frac{\text{Number of Relevant Collisions}}{\text{Total Number of Collisions}}$

or:

Reduction in Cost /Year to Society by Equipping Vehicles with Collision Avoidance Equipment = \$176.5 billion * 0.34 * 0.39 * $\frac{\text{3.1 Million}}{\text{6.4 million}}$ = **\$11.3 billion**

The $11.3 billion per year estimated benefit includes not only vehicle damage but also medical care and loss of income. These are substantial potential benefits to the United States public when collision avoidance devices are incorporated into motor vehicles. AAMA urges the Federal Communications Commission to consider the benefits to society when making decisions on the performance characteristics of motor vehicle radar systems. We recognize that radio

[6] National Accident Sampling System Crashworthiness Data System 1991-1993, U.S. Department of Transportation, National Highway Traffic Safety Administration, DOT HS 808 298. August 1995

astronomy is important to the understanding of the universe, but we also recognize that the potential for reducing human injury and fatalities should be an important part of a public policy decision.

The benefits from equipping vehicles with collision avoidance devices may even be greater than that provided in the above calculations. At the Intelligent Transportation System annual meeting in Houston, Texas, Mr. Philip Recht, Deputy Administrator of the National Highway Traffic Safety Administration said: "***we believe we could save $23 billion per year in crash-related costs***"[7] (emphasis added).

3. Comments on the Hewlett-Packard Company (HP) Comment to Docket 94-124, FCC 95-499

While the HP comments on changing the peak-to average ratio do not directly affect AAMA radar systems, their request could set a precedent which would at a later date. The effect of the request is to eliminate all types of emissions except FM Any waveform modulation such as pulse, AM, etc. would have their effective range limited. Since vehicle radars may use other modulation schemes than FMCW, extension into the vehicle radar band would limit design innovation. If the FCC should rule favorably on the HP request, it should be stated that this is a

[7] Inside ITS April 22, 1996, NHTSA Attempts to Project Benefits of Anti-Crash Devices; page 9

very restricted exception. AAMA submits that the FCC should set performance specifications rather than design specifications.

Summary

AAMA believes that the goals of the Radio Astronomy community can be met even when vehicle radar devices are installed and used by a multitude of drivers. We also believe that the data provided by the United States Department of Transportation showing potential benefit of collision avoidance devices on vehicles should be considered by the Federal Communications Commission.

As vehicular radar technology is developed over the next several years, commercially available test equipment may become available for making repeatable, reliable, objective measurements at these higher frequencies and low power levels. After adequate measurement equipment and proper techniques develop, and field experiments demonstrate whether additional requirements are needed, then rational decisions on more stringent levels of protection above 200 GHz can be made. In the interim, AAMA urges the FCC not adopt any rule more stringent than the proposed level of 1000 pW/cm^2 above 200 GHz.